

AU SABLE RIVER MANGEMENT PLAN

River Management Plan 07

February 2005

Steven P. Sendek

Au Sable River Management Plan

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Introduction

This plan is a companion document to the Au Sable River Assessment (Zorn and Sendek 2001). The River Assessment describes physical characteristics and biological communities of the Au Sable River as well as unique resources found within the watershed. The purpose of a River Assessment is to: identify opportunities and problems related to aquatic resources and fisheries within the watershed; provide a mechanism for public comment into fisheries management decisions; and serve as a reference document for those seeking information regarding the Au Sable River. The Au Sable River Assessment was drafted by Fisheries Division personnel, underwent a significant period of peer and public review and comment, and was completed in March 2001.

The Au Sable River Assessment is a comprehensive document with a long-term focus and is intended for use by others beyond Fisheries Division; it identifies options that include items not within the responsibility of Fisheries Division. The Au Sable River Management Plan is intended as a document for use by Fisheries Division with the purpose of guiding the Division's management actions within the watershed over the short term. It is intended that the actions identified as priorities, after being weighed against other Lake Huron Basin and Division priorities, will appear in annual work plans. This is a working document. Therefore it will receive **annual review and update** for progress made and tasks completed.

Prioritization of Actions

The Management Options contained within the River Assessment are consistent with the mission of Fisheries Division, which is to protect and enhance public trust in populations and habitat of fishes and other forms of aquatic life, and promote optimum use of these resources for benefit of the people of Michigan. In particular, the Division seeks to: protect and maintain healthy aquatic environments and fish communities and rehabilitate those now degraded; provide diverse public fishing opportunities to maximize the value to anglers; and foster and contribute to public and scientific understanding of fish, fishing, and fishery management (Fisheries Division 2000). Selection of Management Actions from the Management Options list is also consistent with and is guided by the objectives found in the Fisheries Division Strategic Plan (Fisheries Division 2000).

Both the Management Options in the Assessment and the selection of Management Actions in the Plan follow the recommendations of Dewberry (1992). Actions that protect and restore headwater streams, riparian areas, and floodplains are given priority because the reconnection of streams and floodplains is critical to the health of the entire river system. The river system is viewed as a whole, for whole-system processes drive many important elements of fish habitat. Actions to protect, preserve, and rehabilitate resources take precedence over actions to improve an area or resources above and beyond the original condition.

A number of mitigating factors will alter strict adherence to this order of priorities. Examples of such factors are selection of actions that may:

- 1) result in very high benefit for relatively low expenditure of effort or cost;
- 2) leverage Fisheries Division's resources by capitalizing on existing momentum and opportunities within a specific community or segment of the watershed;
- 3) reflect significant outside interest or support;
- 4) provide the Division with an opportunity to participate in partnerships;
- 5) continue an ongoing project; appear in another Fisheries Division plan (e.g., Lake Sturgeon Rehabilitation Strategy and Fishery Status Reports);
- 6) fulfill a legal requirement (e.g., FERC related actions);
- 7) involve public health concerns; or
- 8) address concerns for threatened and endangered species.

Selecting Management Actions

This list was developed from the Management Options section of the Au Sable River Assessment. A copy of Management Options section is attached as an appendix to this document. An individual action item may not address an entire Management Option, as many of the Options are wide in scope and long-term. Rather, an action item will accomplish a portion of a Management Option or take a short-term step towards accomplishing a long-term goal.

For each selected Management Action, this Plan identifies the Management Option being addressed and gives a brief explanation of the factors considered in selecting this action as a priority. Each Action also includes a schedule for up to five years for the accomplishment of the action item. This schedule contains information required for completion of annual work plans. These Actions are listed in order of priority, with the highest priority listed first.

Management Action 1

Proposed Action

Au Sable Habitat Restoration.—This action is the continuation of ongoing efforts directed at restoring and enhancing aquatic habitats and populations of aquatic organisms in the Au Sable River watershed. The objective is to restore a component of habitat, large woody debris (LWD), which has been altered and impaired by human activity. Areas of focus will include the Mainstem headwaters, North Branch, South Branch, East Branch, Mio to Alcona reach, Alcona to Loud reach and the six Consumers Energy Impoundments.

Management Option Category: Channel Morphology

Option: Improve channel diversity by adding woody debris or habitat improvement structures in reaches where channel diversity is low, or in reaches where natural contributions of large woody debris have been reduced. Examples are in areas where residential development or past logging practices have eliminated old-growth riparian forests or instream logjams (Mainstem upstream of Mio Pond, and North and South branches of the Au Sable River), and in reaches below dams (Consumers Energy dams) which block downstream transport of woody debris.

Management Option Category: Fisheries Management

Option: Improve habitats for large salmonids in the Mainstem (Headwaters to Wakeley Bridge) and North Branch Au Sable River by adding large woody debris.

Reasons for Selection

This action will result in improvements in channel roughness, channel diversity and restore ecosystem function. Large woody material such as logs in streams provide velocity shelters for fish, attachment sites for invertebrates, and traps organic material that falls into the stream so that it is processed more efficiently. LWD contributes to pool formation, which is beneficial to fish, and also provides perching and basking sites for birds and reptiles. Addition of LWD and other cover into streams has been shown to increase survival of fish, particularly trout species, which are the dominant fish species in the upper Au Sable River watershed.

Schedule

Year 1 (2004):

Personnel days:	Management Biologist 15 days, Technician 10 days
Special needs:	Contract with Huron Pines RC&D for administration assistance and coordinate efforts with U.S. Forest Service on Federal Lands
Project dollars:	\$200,000 from Federal Sport Fish Restoration Act Funds

Year 2 (2005)

Personnel days:	Management Biologist 15 days, Technician 10 days
Special needs:	Contract with Huron Pines RC&D for administration assistance and coordinate efforts with U.S. Forest Service on Federal Lands
Project dollars:	\$200,000 from Federal Sport Fish Restoration Act Funds

Year 3 (2006)

Personnel days:	Management Biologist 15 days, Technician 10 days
Special needs:	Contract with Huron Pines RC&D for administration assistance and coordinate efforts with U.S. Forest Service on Federal Lands
Project dollars:	\$200,000 from Federal Sport Fish Restoration Act Funds

Year 4 (2007)

Personnel days:	Management Biologist 15 days, Technician 10 days
Special needs:	Contract with Huron Pines RC&D for administration assistance and coordinate efforts with U.S. Forest Service on Federal Lands
Project dollars:	\$200,000 from Federal Sport Fish Restoration Act Funds

Year 5 (2008)

Personnel days:	Management Biologist 15 days, Technician 10 days
Special needs:	Contract with Huron Pines RC&D for administration assistance and coordinate efforts with U.S. Forest Service on Federal Lands
Project dollars:	\$200,000 from Federal Sport Fish Restoration Act Funds

Management Action 2

Proposed Action

Grayling Millpond Dam Modification Project.—Modify the Grayling Millpond Dam to reduce the head one foot over a three-year period, construct fish passage and a sediment trap. This action will reconnect upstream habitats to lower reaches, restore seasonal water temperature patterns, and provide upstream and downstream passage for aquatic organisms.

Management Option Category: Channel Morphology

Option: Restore high-gradient habitat in the upper Mainstem by removing Grayling Dam.

Management Option Category: Dams and Barriers

- Option: Protect biological communities of the river by providing upstream and downstream fish passage at all dams to mitigate for habitat fragmentation.
- Option: Restore valuable cold water, riverine habitat by removing Grayling Dam.
- Option: Restore natural transport of sediment and woody debris by removing all dams on the Mainstem Au Sable River.

Management Option Category: Water Quality

- Option: Rehabilitate cold water temperatures below dams by removing or physically modifying dams to reduce their thermal effects on downstream reaches.

Management Option Category: Biological Communities

- Option: Restore potential for fishes to migrate throughout the river system by removing dams wherever possible.

Management Option Category: Fisheries Management

- Option: Restore cold water, riverine fisheries and habitats by removing dams.
- Option: Restore connections between habitats by removing dams no longer used for their original purpose, dams that are a safety hazard, and dams serving little purpose (e.g., Grayling Dam).

Reasons for Selection

This action is to restore and enhance cold water riverine habitats and populations of aquatic organisms by restoring water quality, connectivity, and biological function in the Headwaters Au Sable River. The Grayling dam presently blocks upstream migration of fish, thereby excluding them from spawning and nursery habitats located upstream of the dam. Modifications to the dam are expected to improve overall productivity of the upper mainstem of the Au Sable River.

Schedule:

Year 1 (2004)

Personnel days:	Management Biologist- 10 days
Special needs:	Contractual
Discretionary dollars:	Sport Fish Restoration Act Funding \$100,000, Other funds \$285,000

Year 2 (2005)

Personnel days:	Management Biologist- 2 days, technician- 2 days
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Year 3 (2006)

Personnel days:	Management biologist- 2 days, technician- 2days
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Management Action 3

Proposed Action

Big Creek Impoundment Maintenance.—Repair dike as required in MDEQ dam safety inspection report with rock rip-rap. Return pond to full pool.

Management Option Category: Fishery Management

Option: Manage fish communities in the Mainstem ponds recognizing the limited potential of these habitats.

Reasons for Selection

Big Creek Impoundment is located approximately 5 miles below its outlet from West Twin Lake and several miles above any significant ground water input. The impoundment creates considerable angling opportunities for cool/warm water species such as walleye, smallmouth bass, northern pike, and bluegill. Little angling opportunity for any game fish species existed prior to dam construction. The impoundment also provides very popular recreational opportunities for wildlife viewing and swimming. This action will maximize the existing fishing opportunities in the watershed by restoring a very popular fishery to its pre-drawdown status.

Schedule:

Year 1 (2004)

Personnel days:	Management Biologist 5 days, Technician 6 days, Equipment Operator 7 days
Special needs:	Equipment (excavator, dump truck)
Discretionary dollars:	\$7,000 to purchase geotextile fabric and rock rip-rap

Management Action 4

Proposed Action

Fish Stocking.—Various Mainstem river segments do not support self-sustaining game fish populations or game fish populations at levels high enough to support sport fisheries including several Lake Huron game fish species. Low reproduction is associated with the presence of dams including Mio, Alcona, Loud, Five Channels, Cooke and Foote Dams and Van Etten Lake Level Control Structure. These dams affect fish populations by blocking migration to critical spawning habitats, elevating water temperatures above desirable levels for cold water species, and cause sedimentation of spawning habitats. In addition, dams cause a proliferation of competitive non-game fish species and kill many fish that pass through hydroelectric turbines.

Stocking is required to sustain very popular sport fisheries for game fish species such as steelhead, chinook salmon, rainbow trout, brown trout, and walleye. These stockings will include plants of yearling resident rainbow and brown trout, steelhead, spring fingerling chinook salmon and summer fingerling walleye. The riverine reaches of Mio to Alcona and Alcona to Loud will be stocked annually with yearling rainbow trout and brown trout. The riverine reach below Foote Dam will receive annual plants of steelhead and chinook salmon. Walleye will be stocked in Mio, Alcona, Loud, Cooke, and Foote Impoundments and Van Etten Lakes every other year.

Management Option Category: Fishery Management

Option: Manage the river downstream of Mio Pond to provide high quality fisheries for stocked and naturally reproduced salmonids. Manage fish communities in the Mainstem ponds recognizing the limited potential of these habitats.

Reasons for Selection

This action will continue various popular sport fishing opportunities in flowing waters of the Au Sable River, Mio, Alcona, Loud, Five Channels, Cooke and Foote Impoundments, Van Etten Lake and Lake Huron.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 1 day, Technician 3days
Special needs: Fish stocking

Year 2 (2005)

Personnel days: Management Biologist 1 day, Technician 3days
Special needs: Fish Stocking

Year 3 (2006)

Personnel days: Management Biologist 1 day, Technician 3days
Special needs: Fish stocking

Year 4 (2007)

Personnel days: Management Biologist 1 day, Technician 3days
Special needs: fish stocking

Year 5 (2008)

Personnel days: Management Biologist 1 day, Technician 3days
Special needs: fish stocking

Management Action 5

Proposed Action

Water Quality Protection and Restoration at Foote, Cooke, Five Channels, Loud, Alcona, and Mio Hydroelectric Projects.—This action will provide monitoring of compliance with water quality standards in the 1994 Settlement Agreement with Consumers Energy. This agreement established water quality standards for each project for water temperature, dissolved oxygen, and flow. The FERC licenses issued to Consumers Energy for the Au Sable Projects require mitigation if State Water Quality Standards can not be met. If no method to reduce water quality violations can be found, the Settlement Agreement provides provisions for liquidated damages. These actions will include data collection, analysis, and presentation of findings.

Management Option Category: Dams and Barriers

Option: Rehabilitate cold water temperature conditions downstream of Mio and Alcona dams by removing them or modifying dams to enable cold water releases.

Management Option Category: Water Quality

Option: Protect water quality downstream of Consumers Energy dams by continuously monitoring water temperatures and dissolved oxygen levels, and seeking mitigation for violations of water quality standards.

Reasons for Selection

Resource protection.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 3 days
Special needs: assistance from FERC unit

Year 2 (2005)

Personnel days: Management Biologist 3 days
Special needs: assistance from FERC unit

Year 3 (2006)

Personnel days: Management Biologist 3 days
Special needs: assistance from FERC unit

Year 4 (2007)

Personnel days: Management Biologist 3 days
Special needs: assistance from FERC unit

Year 5 (2008)

Personnel days: Management Biologist 3 days
Special needs: assistance from FERC unit

Management Action 6

Proposed Action

Status of the Fishery Reports.—This action will summarize historical and present biological data collections, historical and present management activities and provide recommendations for future management actions. Priority waters for the Mainstem will include Mio to Alcona reach, Alcona to Loud reach, Mio, Alcona, Loud, Five Channels, Cooke, and Foote Ponds. “Status of the Fishery” reports will be written each year for one or more of these selected waters starting with the Mio to Alcona riverine reach in 2005, the Alcona to Loud riverine reach in 2006, the reach from Foote Dam to the Mouth in 2007 and Mio, Alcona, Loud impoundments in 2008.

Management Option Category: Biological Communities

Option: Survey the present distribution and status of fishes, aquatic invertebrates, mussels, amphibians, reptiles, aquatic plants, and pest species throughout the river system

Reasons for Selection

Management planning requires documentation of the current status of both habitat and aquatic communities to identify any problems that may be amenable to management action. Existing data on habitat and fish communities in the waters listed above has not been fully analyzed and synthesized

into Status of the Fishery (SFR) reports for these waters. These initial SFR's will focus on fisheries communities because there are few data available on invertebrates, mussels, amphibians, reptiles, and aquatic plants.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 5 days

Year 2 (2005)

Personnel days: Management Biologist 5 days

Year 3 (2006)

Personnel days: Management Biologist 5 days

Year 4 (2007)

Personnel days: Management Biologist 5 days

Year 5 (2008)

Personnel days: Management Biologist 5 days

Management Action 7

Proposed Action

Natural Rivers Zoning Administration.—This action will continue the current administration of zoning standards for the Au Sable River, Natural Rivers Plan. This entails participation on the State Natural Rivers Zoning Board, review of applications for variance from construction and use zoning standards and oversight of locally administered Natural Rivers zoning.

Management Option Category: Special Jurisdictions

Option: Protect the river corridor from development by giving the State Natural Rivers Act and the Au Sable River Natural Rivers Plan the force of law.

Management Option Category: Recreational Use

Option: Protect the river by supporting efforts to minimize conflicts among user groups and requiring compliance with guidelines in the Au Sable River Natural Rivers Plan.

Option: Protect the river by giving the State Natural Rivers Act and the Au Sable River Natural Rivers Plan the force of law. This would strictly limit commercial watercraft use on the river to 1987 levels as identified in Au Sable River Natural Rivers Plan.

Reasons for Selection

This action will continue to protect the riparian corridor.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 15 days

Year 2 (2005)

Personnel days: Management Biologist 15 days

Year 3 (2006)

Personnel days: Management Biologist 15 days

Year 4 (2007)

Personnel days: Management Biologist 15 days

Year 5 (2008)

Personnel days: Management Biologist 15 days

Management Action 8

Proposed Action

Permit Reviews.—This action entails reviewing and commenting on plans or permit applications that have the potential to disrupt or degrade aquatic habitats or populations through land disturbances, vegetative changes, ground water / surface water implications, mineral extractions or wetland loss within the watershed. These reviews will specifically involve Forest Compartment reviews, mineral lease reviews, wetland fill applications, Inland Lakes and Streams permit reviews, water discharge permits, and private fish stockings.

Management Option Category: Geology and Hydrology

Option: Protect the natural hydrologic regime of streams by protecting existing wetlands, flood plains, and upland areas that provide recharge to the water table.

Option: Protect the natural seasonal flow patterns of the river by incorporating best management practices and requiring that no additional runoff enter the river from land development.

Management Option Category: Soils and Land Use

Option: Protect lands through land-use planning and zoning guidelines that emphasize protection of critical areas and discourage alteration of natural drainage patterns. Support development of zoning standards for townships presently not zoned.

Option: Protect the river from excessive sedimentation by encouraging education of workers involved in road site planning, construction, and maintenance regarding use of best management practices (BMPs).

Option: Protect the river from excessive sedimentation by reducing densities of oil and gas well pads. This can be accomplished by increasing spacing between oil and gas well pads and supporting increased use of angular drilling techniques.

Management Option Category: Water Quality

Option: Protect water quality by protecting existing wetlands, rehabilitating former wetlands, and maximizing the use of wetlands and floodplains as natural filters.

Option: Protect the river by implementing best management practices for storm water and non-point source pollution.

Management Option Category: Special Jurisdictions

Option: Survey, review, and coordinate all land management plans for state, federal, and corporate lands to ensure adequate protection of the river system.

Management Option Category: Biological Communities, Fisheries Management

Option: Protect stream margin habitats, including floodplains and wetlands, by requiring strict enforcement of Natural Rivers and local zoning regulations and controlling development in the stream corridor.

Option: Protect resident, naturally-reproducing fish populations by screening all private and public fish stockings to ensure they are free of diseases and undesirable species.

Management Option Category: Fisheries Management

Option: Protect self-sustaining trout stocks by discouraging stocking on top of these populations. If fish are stocked, require the stocked fish be certified as disease-free.

Reasons for Selection

This action will protect and maintain healthy aquatic environments and ecosystem function.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 10 days

Year 2 (2005)

Personnel days: Management Biologist 10 days

Year 3 (2006)

Personnel days: Management Biologist 10 days

Year 4 (2007)

Personnel days: Management Biologist 10 days

Year 5 (2008)

Personnel days: Management Biologist 10 days

Management Action 9

Proposed Action

Sediment Trap Maintenance.—This action will continue the annual maintenance of existing sediment traps in the watershed to reduce excess sand bedload in the stream channel. Presently there are ten actively maintained sand traps in the watershed, four on the Mainstem, four on the East Branch Au Sable, one on West Branch Big Creek and one on the South Branch Au Sable. Five sand traps have been discontinued in the watershed as the excess sand bedload has been removed in those areas.

Long term plans are to discontinue all existing sand traps in the watershed as excess bedload is removed.

Management Option Category: Soils and Land Use Patterns, Channel Morphology

Option: Protect channel from excessive sediment delivery by supporting inventories of erosion sites within the watershed, and remediation activities directed at those sites. Rehabilitate channel diversity by removing excess streambed sediment load and controlling sediment contributions.

Reasons for Selection

This action will protect and restore critical instream habitat and channel diversity. Sediment traps can be very effective in removing bedload from streams, including those that do not have a point source of sediment. They can create better habitat through streambed down-cutting, creation of deeper pools, and cleansing of spawning gravel. Removal of sand increases channel roughness and hydraulic diversity, thereby reducing energetic costs for fish. Sand removal allows the stream to uncover LWD buried in excessively sandy channels. They may also result in a deeper and narrower channel, (better width to depth ratio) that reduces stream warming. Finally, they provide a method of reducing sand bedload in streams where significant sources of erosion (such as badly eroding transportation system stream crossings) are beyond the control of fisheries managers.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 2 days, equipment operator – 10 days, Technician 30 days

Year 2 (2005)

Personnel days: Management Biologist 2 days, equipment operator – 10 days, Technician 20 days

Year 3 (2006)

Personnel days: Management Biologist 2 days, equipment operator – 10 days, Technician 20 days

Year 4 (2007)

Personnel days: Management Biologist 2 days, equipment operator – 10 days, Technician 20 days

Year 5 (2008)

Personnel days: Management Biologist 2 days, equipment operator – 10 days, Technician 20 days

Management Action 10

Proposed Action

Resources Inventory.–This action will allow for the survey and inventory of various aquatic resources in the watershed. Data will be collected and summarized for fish populations, stream habitat, water quality and potential impact from excessive beaver populations and will be used in evaluating past management actions and determining future management actions. Status and trends survey schedule

will include the following: 2004 – Au Sable River at Smith Bridge, Stephan Bridge, Connors Flats and Brush Dam; North Branch Au Sable at Sheep Pasture; West Branch Big Creek and Turtle Creek. 2005 – North Branch Au Sable at Eamon's, Dam 4 and Sheep Pasture; and the Upper South Branch Au Sable. 2006 – North Branch Au Sable at Eamon's, Dam 4 and Sheep Pasture; Middle Au Sable River, Pine River and Beaver Creek. 2007 – North Branch Au Sable at Eamon's, Dam 4 and Sheep Pasture; Lower Au Sable River and a watershed beaver inventory. 2008 – Stephan Bridge, Smith Bridge, and West Branch Big Creek

Management Option Category: Biological Communities

- Option: Survey the lower Mainstem to assess the status of fishes of special concern and to aid in development of recommendations for protection and recovery of their populations.
- Option: Survey fish riverine communities in Mainstem from Wakeley Bridge downstream to the river mouth using intensive methods. Survey stream temperature conditions in riverine portions of the lower Mainstem to better assess the potential of these waters for different fishes.

Management Option Category: Fishery Management

- Option: Survey beaver populations and effects on cold water tributaries. Identify measures to control beaver populations where effects are excessive.
- Option: Survey stream temperature conditions in riverine habitats between Wakeley Bridge and the river mouth to assess potential for different sport fishes and help target management to most appropriate species.

Reasons for Selection

Resource inventory for this action will focus on assessment of fish populations and habitat in reaches of the Upper Au Sable River where habitat restoration work has either been accomplished, or is scheduled to occur (See **Management Action 1**). Data on fisheries habitat will be collected using methods defined for MDNR Fisheries Division's Stream Status and Trends program, so that fish abundance and habitat at restored sites can be compared to the regional database that is currently being developed. Fisheries data collected will be used to evaluate the effectiveness of habitat restoration work. Fisheries and habitat will also be surveyed in several tributary reaches not previously surveyed, to increase our knowledge of fisheries in the entire system.

Schedule:

Year 1 (2004)

Personnel days: Management Biologist 10 days, Technician 120 days

Year 2 (2005)

Personnel days: Management Biologist 5 days, Technician 60 days

Year 3 (2006)

Personnel days: Management Biologist 5 days, Technician 60 days

Year 4 (2007)

Personnel days: Management Biologist 8 days, Technician 60 days

Year 5 (2008)

Personnel days: Management Biologist 4 days, Technician 40 days

Management Action 11

Proposed Action

Chinook Salmon Monitoring.—Annually monitor the Chinook salmon spawning run in the lower Au Sable River to determine parameters of the population such as size at age, age distribution, sea lamprey wounding, and origin (hatchery vs. wild). These data will be used to assess reproduction, trends in growth rates, and sea lamprey abundance in Lake Huron. Two hundred fish will be collected each September/October from the river by electro fishing.

Management Option Category: Fisheries Management

Option: Protect fish communities and improve ability to target fisheries management by initiating ecosystem-level monitoring of physical and biological characteristics of the Mainstem and tributaries throughout the watershed.

Reasons for Selection

This action will provide valuable information for the management of Chinook salmon within the basin.

Schedule

Year 1 (2004)

Personnel days: Management Biologist 2 days, Technician 14 days

Year 2 (2005)

Personnel days: Management Biologist 2 days, Technician 14 days

Year 3 (2006)

Personnel days: Management Biologist 2 days, Technician 14 days

Year 4 (2007)

Personnel days: Management Biologist 2 days, Technician 14 days

Year 5 (2008)

Personnel days: Management Biologist 2 days, Technician 14 days

Management Action 12

Proposed Action

Investigate Potential for Fish Passage past Dams.—Investigate the potential to provide fish passage for various fish species over various barriers within the watershed. We will draft a document explaining our rationale for selective fish passage and submit it to the U.S. Fish and Wildlife Service and U. S. Forest Service for support. The rationale will identify specific species to be passed, numbers of each species to be passed, identify riverine reaches fish will be passed into and proposed methods for

passing fish. Year one and two will involve drafting the rational and year three will involve dialog with the agencies to achieve support.

Management Option Category: Dams and Barriers

Option: Protect biological communities of the river by providing upstream and downstream fish passage at all dams to mitigate for habitat fragmentation.

Option: Protect the Au Sable River from invasion by sea lamprey by modifying fish passage structures at Foote Dam and the Van Etten Lake-level control structure.

Management Option Category: Biological Communities

Option: Restore historic runs of potamodromous fishes and the productive capacity of remaining high-gradient, riverine reaches in the lower Mainstem by removing barriers or installing fish passage structures to re-connect them to Lake Huron.

Management Option Category: Fisheries Management, Recreational Use

Option: Protect fish communities in Lake Huron from sea lamprey by placing a lamprey barrier on the Mainstem downstream of the mouth of the Pine River.

Option: Restore runs of native and naturalized fishes, other than sea lamprey, by providing upstream and downstream fish passage at dams.

Management Option Category: Recreational Use

Option: Improve recreational fishing potential of the lower Mainstem by removing dams when possible and providing upstream passage of Lake Huron fishes into existing riverine reaches.

Reasons for Selection

This project can have an immediate and direct benefit to many fish species including salmonids, walleye, perch, northern pike, catfish, and forage minnows. Greater potential for natural reproduction and angling opportunities can be obtained.

Schedule:

Year 1 (2005)

Personnel days: Management Biologist 15 days

Year 2 (2006)

Personnel days: Management Biologist 15 days

Year 3 (2007)

Personnel days: Management Biologist 20 days

Management Action 13

Proposed Action

Lake Sturgeon reintroduction.—Develop a strategy to reintroduce lake sturgeon into suitable habitats within the watershed as established by the Lake Sturgeon Rehabilitation Plan, (Hay-Chmielewski and Whelan, 1997) working through the Lake Sturgeon Rehabilitation Committee. Actions will include prioritization of waters within the watershed, selection of most suitable brood source, development of a strategy for collecting gametes, and establishment of a rearing program within the hatchery system, which will result in the stocking of sturgeon into the watershed in 2008. Potential areas would include Mio, Alcona, and Loud ponds and the Mainstem reach below Foote Dam.

Management Option Category: Biological Communities

Option: Restore lake sturgeon populations in the lower Mainstem by stocking fish into lower river impoundments.

Management Option Category: Fisheries Management

Option: Survey potential for re-introducing lake sturgeon in remaining riverine reaches (i.e., above Mio Dam, Mio Dam to Alcona Dam, and Alcona Dam to Loud Dam).

Reasons for Selection

Lake Sturgeon once inhabited the entire watershed prior to river fragmentation by dams, and is a listed “Threatened” species.

Schedule

Year 1 (2004)

Personnel days: Management Biologist 2 days

Year 2 (2005)

Personnel days: Management Biologist 2 days

Year 3 (2006)

Personnel days: Management Biologist 2 days

Year 4 (2007)

Personnel days: Management Biologist 2 days
Special needs: lake sturgeon culture for stocking

Year 5 (2008)

Personnel days: Management Biologist 2 days
Special needs: lake sturgeon culture for stocking

Management Action 14

Proposed Action

Conduct creel census from Mio to Alcona River reach.—This action will provide important information needed to help guide future manage actions for this intensely manage fishery. New habitat restoration efforts are in progress to restore channel roughness through the addition of large

woody debris. The presence and operation of Mio and Alcona Dams has severely limited natural reproduction of resident brown and rainbow trout requiring annual stockings of 96,000 yearling trout to support the very popular trout fishery. In addition, special restrictive angling regulations have been imposed on a significant portion of this reach to provide a trout population with a significant number of larger fish.

Management Option Category: Fisheries Management

Option: Survey sport fisheries from Wakeley Bridge to the river mouth to assess fishing pressure, catch, and economic value.

Management Option Category: Recreational Use

Option: Survey levels of recreational use of the lower Mainstem and its ponds by anglers, canoeists, and boaters. Estimate the economic value of the lower Mainstem in its present state for comparison with economic estimates made for different river management scenarios, such as the lower Mainstem without dams.

Reasons for Selection

This action will aid in the management of these water bodies by evaluating the effectiveness of current management activities and directing future management activities.

Schedule

Year 5 (2008)

Personnel days:	Management Biologist 5 days
Special needs:	contractual, \$40,000

References

- Dewberry, T.C. 1992. Protecting the biodiversity of riverine and riparian ecosystems: the national river public land policy development project. Transactions of the 57th North American Wildlife and Natural Resources Conference. Pp. 424-432.
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- Hay-Chmielewski, E.M. and G.E. Whelan. 1997. Lake sturgeon rehabilitation strategy. Michigan Department of Natural Resources, Fisheries Division, Special Report 18. Ann Arbor, Michigan.
- Zorn, T.G., and S.P. Sendek. 2001. Au Sable River Assessment. Michigan Department of Natural Resources, Fisheries Special Report 26, Ann Arbor.

Management Unit Supervisor

Date

Basin Coordinator

Date

Chief, Fisheries Division

Date

Appendix

The following is a copy of the **Management Options** section of the Au Sable River Assessment, Michigan Department of Natural Resources, Fisheries Division Special Report 26, Ann Arbor.

Management Options

In its present state, the Au Sable River is a high quality resource that has tremendous additional fishery and recreation potential. A number of fishery-related problems need attention before this potential can be realized. The management options presented in this plan address the most important, presently understood problems and establish priorities for further investigation.

The options follow the recommendations of Dewberry (1992), who outlined measures needed to protect the health of the nation's riverine ecosystems. Dewberry stressed protection and rehabilitation of headwater streams, riparian areas, and floodplains. Stream segments need to be re-connected to each other, and the channel needs to be reconnected its floodplain. We must view the river system as a whole, because system-level processes are the primary influence on stream habitat and fish communities through time.

The identified options are consistent with the mission statement of the MDNR Fisheries Division. Its mission is to protect and enhance the public trust in populations and habitat of fishes and other forms of aquatic life, and promote optimum use of these resources for the benefit of the people of Michigan. In particular, Fisheries Division seeks to: protect and maintain healthy aquatic environments and fish communities; rehabilitate those communities now degraded; provide diverse public fishing opportunities to maximize the value to anglers; and foster and contribute to public and scientific understanding of fish, fishing, and fishery management.

Options convey three approaches to addressing problems in the watershed. First, we present options to protect and preserve existing resources. Second are options requiring additional surveys to help direct management. Third are opportunities for rehabilitation or restoration of degraded resources. Opportunities to improve an area or its resources, given its present status, are listed last.

Geology and Hydrology

The Au Sable River has extremely stable flows. Several reaches, however, have less stable flows than expected or desired. Increasing urban development in areas has the potential to reduce the stability of river flows. The most severe flow problems are caused by operation of the complex of dams from Mio to Oscoda and lake-level control structures.

- Option: Protect the natural hydrologic regime of streams by protecting existing wetlands, flood plains, and upland areas that provide recharge to the water table.
- Option: Protect and restore groundwater recharge by requiring that all development-related runoff be captured by infiltration basins.
- Option: Protect the natural seasonal flow patterns of the river by incorporating best management practices and requiring that no additional runoff enter the river from land development.

- Option: Protect existing hydrologic conditions of lakes and remaining natural lake outlets by prohibiting construction of new lake-level control structures. This would assure occurrence of natural water level fluctuations needed to maintain wetlands in the lake and at lake outlets.
- Option: Restore natural hydrologic regime of streams by removing dams when possible, and requiring existing dams to strictly adhere to run-of-river flow operation.
- Option: Restore natural hydrologic regime of lakes and lake outlets by removing lake-level control structures when possible.
- Option: Restore headwater, tributary, and Mainstem run-of-river flows by operating lake-level control structures as fixed-crest structures with wide spillways rather than by opening and closing gates.

Soils and Land Use Patterns

Soils in the Au Sable River watershed are generally coarse-textured, providing high infiltration and groundwater recharge, but are also extremely erodible and susceptible to improper land use. Many fire-maintained prairies and pine forests have been replaced by deciduous forests due to fire suppression. Residential development within the watershed is proceeding relatively rapidly, pointing to the need for greater land use planning.

- Option: Protect watershed soils from improper land use by encouraging formation of a basin-wide, locally-based watershed council to assist in land use planning, development, and other river protection issues.
- Option: Protect undeveloped private riparian lands by bringing lands under public ownership or through economic incentives such as tax credits, deed restrictions, conservation easements, or other means.
- Option: Protect lands through land-use planning and zoning guidelines that emphasize protection of critical areas and discourage alteration of natural drainage patterns. Support development of zoning standards for townships presently not zoned.
- Option: Protect channel from excessive sediment delivery by supporting inventories of erosion sites within the watershed, and remediation activities directed at those sites.
- Option: Protect the river from excessive sedimentation by encouraging education of workers involved in road siting, construction, and maintenance regarding use of best management practices (BMPs).
- Option: Protect the river from excessive sedimentation by reducing densities of oil and gas well pads. This can be accomplished by increasing spacing between oil and gas well pads and supporting increased use of angular drilling techniques.
- Option: Protect the river from excessive sedimentation associated with oil and gas development by requiring quicker re-vegetation of soils in effected areas.
- Option: Protect channel from excessive sediment delivery by using BMPs at road-stream crossings. Support cooperative funding in situations when local road commission budgets are inadequate for use of BMPs.

- Option: Protect the river within the Au Sable State Forest by developing a forest management plan that addresses water quality issues.
- Option: Protect channel from excessive sediment delivery from State Forest roads by supporting efforts to appropriate funds for their maintenance.
- Option: Survey road-stream crossings to identify problem areas and implement BMPs.
- Option: Restore lost fire-maintained prairie and savannah habitats where possible, and discourage development in fire-prone upland habitats, such as outwash plains.

Channel Morphology

Compared to other rivers in Lower Michigan, the Au Sable River is a high-gradient stream. Dams now impound many of the highest gradient reaches on the Mainstem, particularly in the middle and lower portions of the river. Past logging activities eliminated old-growth riparian forests, and altered stream channel shape by removing large woody debris and increasing sedimentation. Removal of the river's excess sediment bedload may require decades due to the river's stable flow characteristics. Relatively young, second growth forests provide less shading and contribute a limited amount of woody debris to the stream channel. Residential development along the riparian corridor has eliminated some riparian forest and natural stream bank habitat.

- Option: Protect diverse stream channel habitats by preventing removal of large woody debris now in the river.
- Option: Protect and restore riparian forests by educating riparian residents on how riparian forests influence water quality, stream temperatures, trophic conditions, channel morphology, bank erosion and stability, and aquatic, terrestrial, and avian communities.
- Option: Protect riparian greenbelts through adoption and enforcement of zoning standards.
- Option: Protect riparian corridors of Consumers Energy ponds by maintaining current ownership or transferring ownership to state and federal agencies. This will prevent fragmentation and residential development of riparian habitat.
- Option: Survey channel characteristics of the upper Mainstem and compare them to past records to assess the rate and extent of channel changes. Data are especially needed in the Headwaters to Wakeley Bridge and Wakeley Bridge to Mio Pond segments.
- Option: Survey cold water streams to identify where high beaver activity (or beaver dam density) adversely affects riparian habitats and stream channel morphology.
- Option: Restore high-gradient habitat in the upper Mainstem by removing Grayling Dam.
- Option: Restore extremely rare, high-gradient reaches of the lower Mainstem by removing dams, with top priority on Five Channels and Alcona dams which impound >10 ft/mi gradient habitats.
- Option: Restore rare high-gradient habitats by removing dams no longer used for their original purpose (for example, retired hydroelectric facilities), dams which are a safety hazard, and dams serving little purpose.

- Option: Rehabilitate channel diversity by removing excess streambed sediment load and controlling sediment contributions.
- Option: Improve channel diversity by adding woody debris or habitat improvement structures in reaches where channel diversity is low, or in reaches where natural contributions of large woody debris have been reduced. Examples are in areas where residential development or past logging practices have eliminated old-growth riparian forests or instream logjams (e.g. Mainstem upstream of Mio Pond, and North and South branches of the Au Sable River), and in reaches below dams (e.g. Consumers Energy dams) which block downstream transport of woody debris.

Dams and Barriers

One hundred and nine (109) dams are within the watershed. These dams impound considerable high-gradient habitat, block potamodromous migrations of fishes, block migrations of resident fishes, eliminate wetlands at lake outlets, create flow fluctuations in streams and eliminate natural lake-level fluctuations, trap sediments and woody debris, elevate stream temperatures, and impair water quality.

- Option: Protect biological communities of the river by providing upstream and downstream fish passage at all dams to mitigate for habitat fragmentation.
- Option: Protect fishery resources by screening turbine intakes at operating hydroelectric dams.
- Option: Protect the Au Sable River from invasion by sea lamprey by modifying fish passage structures at Foote Dam and the Van Etten Lake-level control structure.
- Option: Protect the public trust by requiring dam owners to make appropriate financial provisions for future dam removal or perpetual maintenance.
- Option: Survey and develop a list of barriers to fish passage, and correct those that are fragmenting the system.
- Option: Survey dams on tributaries to identify areas where environmental damage and the need for mitigation are greatest.
- Option: Survey State-owned dams to determine their usefulness or potential for removal.
- Option: Restore valuable cold water, riverine habitat by removing Grayling Dam and Robinson Creek Flooding Dam.
- Option: Restore free-flowing river conditions by removing dams no longer used for their original purpose (e.g. retired hydroelectric facilities, dams which are a safety hazard, and dams serving little purpose).
- Option: Restore natural river flows at hydropower dams, lake-level control structures, and other dams by requiring dam owners to operate at run-of-river.
- Option: Restore natural transport of sediment and woody debris by removing all dams on the Mainstem Au Sable River.

- Option: Restore natural fluctuations in lake levels by removing lake-level control structures when possible.
- Option: Rehabilitate the former productivity of the Au Sable River for Lake Huron fishes by removing dams on the lower Mainstem and installing fish passage structures at remaining dams.
- Option: Rehabilitate cold water temperature conditions downstream of Mio and Alcona dams by removing them or modifying dams to enable cold water releases.
- Option: Rehabilitate run-of-river flows at lake outlets with existing lake-level control structures by physically modifying dams so that such flows are maintained. For example, fixed crest dams with wide spillways could be installed at lakes that can potentially release large volumes of water.
- Option: Rehabilitate natural river flows by amending the Lake-level Control Act.

Water Quality

Water quality is excellent throughout much of the watershed. However, dams significantly impair water quality on the Mainstem. Effects of dams on the water quality of tributaries are unknown. Many contaminated (Act 307) sites exist in the watershed and need to be cleaned up.

- Option: Protect water quality downstream of Consumers Energy dams by continuously monitoring water temperatures and dissolved oxygen levels, and seeking mitigation for violations of water quality standards.
- Option: Protect water quality by protecting existing wetlands, rehabilitating former wetlands, and maximizing the use of wetlands and floodplains as natural filters.
- Option: Protect the river by implementing best management practices for storm water and non-point source pollution.
- Option: Survey water quality characteristics (especially nutrient levels) at sites in the watershed where historic data exist to better determine the extent of temporal changes in water quality.
- Option: Survey effects of non-point source pollutants (especially salt brines) on river water quality characteristics.
- Option: Survey temperature elevation effects of other dams in the watershed, and develop a list of dams having the greatest thermal effect on downstream reaches.
- Option: Survey dissolved oxygen levels below other dams in the watershed to determine where effects are greatest.
- Option: Survey loading of nutrients and sediments to the river and develop strategies to reduce identified problems.
- Option: Rehabilitate cold water temperatures below dams by removing or physically modifying dams to reduce their thermal effects on downstream reaches. For

example, Grayling Dam could be removed, and Mio and Alcona dams could be physically modified to release cold water.

Option: Restore water quality in the Pine River system by preventing livestock from accessing streams.

Option: Restore water quality by supporting Act 307 site cleanups.

Special Jurisdictions

The Federal Energy Regulator Commission licenses six active hydropower facilities in the watershed. The State of Michigan and United States Government own large amounts of land in the watershed, including important riparian habitats. They are also responsible for administering laws necessary for protection of the environment and biological communities. Local units of government and county road commissions are responsible for road-stream crossings and many lake-level control structures which affect sedimentation rates and streamflow conditions in many areas.

Option: Protect and restore the river system by supporting cooperative planning and decision-making. Develop a Geographic Information System that could be used to facilitate these processes.

Option: Protect and restore the lower Mainstem by holding all parties to terms of the Settlement Agreement reached for the six Consumers Energy dams.

Option: Protect the river corridor from development by giving the State Natural Rivers Act and the Au Sable River Natural Rivers Plan the force of law.

Option: Survey existing statutory authorities to determine if additional statutory authority is needed to protect the river system.

Option: Survey, review, and coordinate all land management plans for state, federal, and corporate lands to ensure adequate protection of the river system.

Biological Communities

Biological communities are generally healthy, though they are considerably different than what was originally present. Some native species have been greatly reduced or lost (e.g. Arctic grayling and upriver populations of lake sturgeon) while other species have been introduced, some desirable (e.g. salmonids) and others undesirable (e.g. carp and sea lamprey). Many attempts to restore Arctic grayling have failed, in part because of the species' apparent need for large, cold, un-fragmented rivers with few competing species (Nuhfer 1992). Most significant change to biological communities results from fragmentation of the system, loss of high-gradient habitats, and alteration of water quality by dams. Present stream habitats show reduced levels of fish abundance and production, due to the lack of a large potamodromous fish component, that being inland migrations and production of Lake Huron fishes. Present aquatic communities in areas throughout the system, and especially in the lower Mainstem, contain proportionately more cool- and warmwater species than coldwater fishes due elevation of summer temperatures by impoundments. Accelerated soil erosion and stream sedimentation in certain areas has reduced the availability of clean gravel-cobble habitats important to many aquatic species. Rarity of other species that require old growth forest (particularly floodplain

forests) and large, free-flowing rivers shows the need to protect and restore these habitats in the watershed.

- Option: Protect gravel habitats from sedimentation due to land development by enforcing local soil and sedimentation codes. Implement nonpoint source best management practices at construction sites.
- Option: Protect stream margin habitats, including floodplains and wetlands, by requiring strict enforcement of Natural Rivers and local zoning regulations and controlling development in the stream corridor.
- Option: Protect biological communities associated with remaining high-gradient riverine habitats.
- Option: Protect resident, naturally-reproducing fish populations by screening all private and public fish stockings to ensure they are free of diseases and undesirable species.
- Option: Survey the historic record to determine pre-settlement flora, fauna, and habitat conditions in the watershed.
- Option: Survey the present distribution and status of fishes, aquatic invertebrates, mussels, amphibians, reptiles, aquatic plants, and pest species throughout the river system.
- Option: Survey the lower Mainstem to assess the status of fishes of special concern and to aid in development of recommendations for protection and recovery of their populations.
- Option: Survey fish riverine communities in Mainstem from Wakeley Bridge downstream to the river mouth using intensive methods.
- Option: Survey stream temperature conditions in riverine portions of the lower Mainstem to better assess the potential of these waters for different fishes.
- Option: Restore potential for fishes to migrate throughout the river system by removing dams whenever possible.
- Option: Restore historic runs of potamodromous fishes and the productive capacity of remaining high-gradient, riverine reaches in the lower Mainstem by removing barriers or installing fish passage structures to re-connect them to Lake Huron
- Option: Restore lake sturgeon populations in the lower Mainstem by stocking fish into lower river impoundments.
- Option: Rehabilitate gravel habitats by removing excessive sand bedload from the upper Mainstem and its tributaries.

Fishery Management

Stable, groundwater-dominated flows represent the key value of the Au Sable River. The river has the potential to support substantial populations of highly-valued, coldwater fishes along much of its length. Fishing is good in most parts of the watershed. Much of the upper Mainstem and its tributaries provide excellent fishing for self-sustaining populations of brown and brook trout. In other areas,

salmonid populations are adversely affected by a lack of woody structure, habitat fragmentation, elevated water temperatures, unnatural flow fluctuations, excessive sedimentation, and sand bedload. Six large ponds on the lower Mainstem have altered the river, limiting the potential for its management as a cold water river. Groundwater-dominated flows and high flushing rates through the ponds limit their ability to support valuable fisheries for cool- and warm-water lake fishes. Thus the lower Mainstem provides only fair to good fishing. These ponds, and a lack of fish passage to remaining upstream riverine reaches, limit development of valuable riverine fisheries for trout and potamodromous fishes.

- Option: Protect fish communities in Lake Huron from sea lamprey by placing a lamprey barrier on the Mainstem downstream of the mouth of the Pine River.
- Option: Protect self-sustaining trout stocks by discouraging stocking on top of these populations. If fish are stocked, require the stocked fish be certified as disease-free.
- Option: Protect self-sustaining trout stocks by developing an educational pamphlet that addresses Fisheries Division concerns related to fish stocking.
- Option: Protect habitats for large fishes throughout the river system by protecting existing riparian forests.
- Option: Protect fish communities and improve ability to target fisheries management by initiating ecosystem-level monitoring of physical and biological characteristics of the Mainstem and tributaries throughout the watershed.
- Option: Survey potential for re-introducing lake sturgeon in remaining riverine reaches (i.e. above Mio Dam, Mio Dam to Alcona Dam, and Alcona Dam to Loud Dam)
- Option: Survey submerged structural habitat in Loud and Five Channels ponds.
- Option: Survey beaver populations and effects on cold water tributaries. Identify measures to control beaver populations where effects are excessive.
- Option: Survey stream temperature conditions in riverine habitats between Wakeley Bridge and the river mouth to assess potential for different sport fishes and help target management to most appropriate species.
- Option: Survey sport fisheries from Wakeley Bridge to the river mouth to assess fishing pressure, catch, and economic value.
- Option: Survey biological communities and fisheries of comparable streams with and without potamodromous runs to evaluate biological and fishery effects of fish passage.
- Option: Survey options for discharging cold water from Mio and Alcona ponds to improve downstream habitat for salmonid reproduction and survival.
- Option: Manage the river upstream of Mio Pond to provide a high quality fishery for resident, naturally-reproducing brook trout and brown trout stocks.
- Option: Manage the river downstream of Mio Pond to provide high quality fisheries for stocked and naturally reproduced salmonids.

- Option: Manage fish communities in the Mainstem ponds recognizing the limited potential of these habitats.
- Option: Restore cold water riverine fisheries and habitats by removing dams.
- Option: Restore runs of native and naturalized fishes, other than sea lamprey, by providing upstream and downstream fish passage at dams.
- Option: Restore fish communities in river delta habitats by removing dams and allowing natural downstream transport of sediment to Lake Huron.
- Option: Restore high-gradient habitat for lake sturgeon by removing dams on the lower Mainstem (especially Alcona, Loud, and Five Channels dams) and providing passage into riverine reaches.
- Option: Restore connections between habitats by removing dams no longer used for their original purpose, dams which are a safety hazard, and dams serving little purpose. For example, Grayling Dam.
- Option: Rehabilitate fish communities and habitat by removing state-owned dams on trout streams.
- Option: Rehabilitate stream habitats and wetland habitats at lake outlets by working with owners of private dams on lake-level management issues.
- Option: Improve habitats for large salmonids in the Mainstem (Headwaters to Wakeley Bridge) and North Branch Au Sable River by adding large woody debris.
- Option: Improve survival of fishes migrating downstream by providing fish passage and screening turbine intakes at hydropower facilities.

Recreational Use

The watershed provides extensive recreational opportunities. Angling use and canoe traffic are heavy on presently available riverine reaches. The number of commercial canoes registered for use on the river has exceeded the limit identified in the Au Sable River Natural Rivers Plan (Anonymous 1987). Impoundments on high-gradient reaches of the lower Mainstem from Mio Pond to Foote Dam have the potential to provide spectacular riverine fisheries, and some of the best canoeing, kayaking, and sightseeing waters in Lower Michigan. Present fishery and recreational opportunities in this reach range from fair to good. Public access to the river is generally good.

- Option: Protect the river by supporting efforts to minimize conflicts among user groups and requiring compliance with guidelines in the Au Sable River Natural Rivers Plan.
- Option: Protect the river by giving the State Natural Rivers Act and the Au Sable River Natural Rivers Plan the force of law. This would strictly limit commercial watercraft use on the river to 1987 levels as identified in Au Sable River Natural Rivers Plan.
- Option: Protect the river by having all commercial watercraft (e.g. canoes, kayaks, and boats) included in the count toward the maximum number of commercial watercraft permitted for use on the river. Commercial use of inflatable and inner tubes on the river should be banned.

- Option: Survey level of recreational use of the lower Mainstem and its ponds by anglers, canoeists, and boaters. Estimate the economic value of the lower Mainstem in its present state for comparison with economic estimates made for different river management scenarios, such as the lower Mainstem without dams.
- Option: Improve recreational fishing potential of the lower Mainstem by removing dams when possible and providing upstream passage of Lake Huron fishes into existing riverine reaches.
- Option: Improve existing small-scale public access sites to minimize their effects on the river.
- Option: Improve public access at hydropower facilities under FERC re-licensing agreements.

Citizen Involvement

Citizen involvement is a critical component to the management of the Au Sable River watershed. Continuous interaction between management entities, user groups, and interested citizens is needed to support fisheries management activities.

- Option: Protect and restore watershed integrity by building public support through a network of citizen involvement groups.
- Option: Protect the Au Sable River system by encouraging formation of a locally-driven, basin-wide watershed council to direct watershed planning and management of the river system from a long-term, broad-based, community-oriented perspective.
- Option: Protect and rehabilitate the watershed by educating river users and property owners on sound watershed management.
- Option: Protect the river by supporting efforts of interest groups seeking funding to protect and improve the river system.
- Option: Protect the river by developing an Au Sable River web site for exchange of information on the river.
- Option: Protect the river by conducting an economic study to determine the river's value to local communities. Use findings to educate others of the value of the Au Sable River to the region.
- Option: Protect the basin by continuing to work cooperatively with governmental and non-governmental groups on common stewardship issues.
- Option: Survey other watersheds in the state to identify watershed councils that could serve as mentors or guides in formation of an Au Sable River Watershed Council.